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ABSTRACT

This first article in a series on telecommunications in rural America provides an overview of several key telecommunication issues facing rural regions. High speed data services known as broadband have the potential to make rural areas less isolated and improve the rural quality of life, but physical barriers, sparse population density, and few markets present significant obstacles to their deployment in rural areas. Three types of broadband delivery--digital subscriber line (DSL), cable modems, and wireless--are discussed, along with their advantages and limitations for rural implementation. E-commerce, the use of the Internet for commerce, is expanding rapidly. Whether e-commerce will help rural enterprises thrive or hurt rural areas by increased by-passing of the middle man is yet to be seen. The telecommunications industry was deregulated to offer customers the benefits of competition, but the need for a physical connection between the phone company and the customer makes true competition impractical, especially in sparsely populated rural areas. Rural and urban residents are unlikely to have the same competitive choices. The Telecommunications Act of 1996 provided for subsidies to rural schools, libraries, and health care providers for various telecommunications services. Schools in rural high-cost areas were specifically targeted to receive the highest "e-rate" discounts. Recent regulatory developments have allowed wireless technologies to receive ETC (eligible telecommunications carrier) status. Whether regulators will require wireless services to replace wireline service will have a profound effect on the availability of advanced services in rural areas. (TD)

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The Main Street Economist

Commentary on the rural economy

Rural America's Stake in the Digital Economy

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In an age when farmers can trade futures while standing in a wheat field, and small-town doctors can download x-rays from hospitals hundreds of miles away, the potential for rural America to benefit from advances in telecommunications seems limitless. As Internet technology evolves, consumers will continue to enjoy more access to information and new ways of doing business. And as the telecom industry becomes less regulated, consumers are positioned to enjoy the fruits of new competition. But as this "telecom revolution" unfolds, will people on Main Street enjoy the same benefits as their urban and suburban counterparts?

In the coming year, the Center for the Study of Rural America will publish a series of articles on telecommunications in rural America. These articles will appear in the *Main Street Economist* and elsewhere. This month we provide an overview of several key telecom issues facing rural regions that range from high-speed data services to e-commerce to telemedicine—issues that are critical if Main Street is to keep pace as information technology changes the way America does business.

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Key rural telecom issues

In the near future, enhanced connectivity and information infrastructure will prove crucial to the health of the rural economy. Telecommunications will be critical not only for rural development—attracting and retaining residents and businesses—but for basic sustainability in an ever-changing economic environment. In coming months, the Center for the Study of Rural America will examine:

- ***The outlook for rural, high-speed data.*** Are advances in telecommunications creating a "digital divide" or building a "digital bridge" between urban and rural America?
- ***The effect of e-commerce on the rural economy.*** Will e-commerce help rural enterprises to thrive, or will they fall victim to new methods of by-passing the middle man?
- ***Government support for telemedicine and distance learning.*** Is rural America receiving its share, and are these subsidies going to the rural areas most in need?
- ***The growth of competition.*** Competition brings innovation, cost-based prices, customer choices. Will rural America enjoy the same competitive benefits as urban residents?
- ***Alternative technologies such as wireless.*** Will satellites and microwave replace wires?

High-speed data services

The phenomenal growth in the use of data applications—Internet access, telecommuting, e-commerce, distance learning, etc.—has led consumers to demand devices that move data faster than ever before. Generally referred to as *broadband*, these high-speed data mechanisms currently serve over two million residential customers across the United States.[1] Industry forecasts predict this number will grow to 16.6 million by 2004.

But broadband deployment represents something of a conundrum for rural policymakers. High-speed data has the potential to make rural areas less isolated, and high-speed applications such as telemedicine can significantly improve rural quality-of-life. But rural areas present real challenges for the telephone and cable TV companies that will provide the high-speed data services. For example, there are physical barriers to deployment, customers are few and widely dispersed, and rural areas seldom represent the most attractive markets. It is no mystery why less than 1 percent of towns with less than 2,500 people currently have any broadband deployment at all (Chart 1).

There are generally three ways to deploy high-speed data on a market-wide basis. *Digital subscriber line*, or *DSL*, uses the telephone network. *Cable modems* use the cable television network. And certain *wireless* approaches use satellite or microwave technology. Each technology has advantages, but each also has limitations that might deter companies from offering services in rural or remote areas.

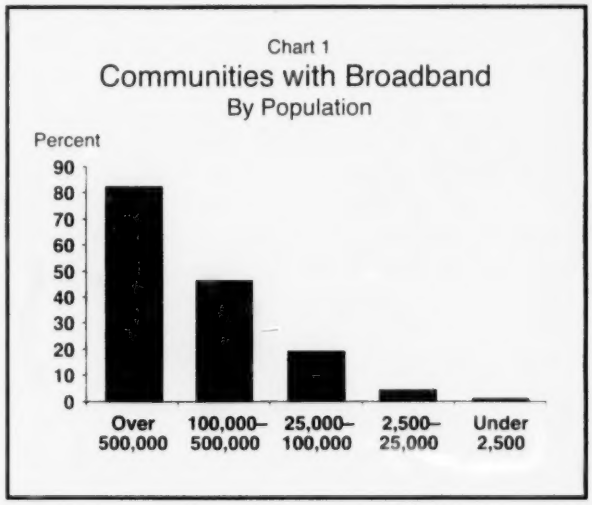
For *DSL*, the key advantage is that it uses the existing telephone infrastructure, an infrastructure that is virtually ubiquitous, even in many remote areas. The disadvantages for rural customers are that many customers live too far from the telephone company's office to receive the service, and that the telephone company must achieve a "critical mass" of customers to offset the cost of deploying additional equipment in the central office.

For *cable modems*, the advantages include extremely high speed (even faster than DSL) and the fact that the service uses the existing cable network. Disadvantages include the same "critical mass" issue facing DSL and a cable network that must be upgraded. Moreover, the cable television network is not ubiquitous, particularly in remote areas.

In the case of *wireless* options, satellite technologies may ultimately represent the best method for reaching remote areas that lack a critical mass of customers. Currently only two providers (Tachyon and DirecPC) offer satellite-based data of any kind, but availability is limited and in many cases the speed that is offered does not qualify as broadband. Several other commercial satellite providers plan to introduce service by 2002–03, but all potential providers face the obstacle of significant up-front investment. Cost estimates for satellite systems range from $4 billion to over $10 billion for global systems.[2]

A future issue of the *Main Street Economist* will examine the issue of access to high-speed data in rural regions. Specifically, what barriers (technological or market-driven) might prohibit high-speed deployment in rural America? And what is the overall outlook for rural broadband services?

Chart 1



The effect of e-commerce on rural America and agriculture

The amazing growth of the Internet for commercial use has revolutionized U.S. economic activity. Some sources estimate that by 2003 e-commerce will account for over $3.2 trillion dollars of U.S. economic activity annually, or the equivalent of

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29 percent of all domestic sales and purchases.[3] Rural America, and agriculture in particular, may be a latecomer to this online activity, but it will not be left behind. E-commerce in agriculture is expected to flourish; estimates place the value of e-commerce for agriculture in the range of $70 billion by 2003, with greater growth in the years that follow. All market participants—from the largest agribusiness giants to the smallest family-owned orchards—are expected to join the online parade.

In general, all e-commerce falls into three separate but related activities:

- Providing information (the "Internet-as-channel," a new mechanism for advertising and marketing services and products).
- Bringing together buyers and sellers (making a market), through bulletin boards, online exchanges, retail web sites, etc.
- Completing the purchase, or executing the transaction.

Each of these activities already takes place in the agriculture industry over the Internet. A search on any standard search engine reveals hundreds of thousands of sites offering information. Products such as fertilizer, chemicals, seeds, equipment, produce, and livestock are all advertised and sold on line. Financing will soon follow. On-line auctions currently offer buyers and sellers a single mechanism for executing transactions, arranging shipping, transferring funds, and providing delivery of everything from fungicides to balers.

But what will be the overall effect of this e-commerce on agribusiness? If growers choose to contact equipment suppliers directly, will online information and ordering replace the function of local distributors? Will product differentiation occur in what were previously considered commodity markets? Will the creation of supply chains be facilitated or inhibited by the lower transaction costs associated with the Internet? And how will these effects on agriculture filter through the rural economy as a whole?

The *Main Street Economist* will examine these trends in e-commerce and agriculture. We will also discuss the nonagriculture-related effects of e-commerce on rural America: the establishment of rural call centers, increased telecommuting as a factor in demographic shifts, and other related issues.

The state of competition in rural America

A primary reason Congress passed the 1996 Telecommunications Act was to deregulate the industry and increase competition. Following the breakup of the Bell/AT&T system in 1984, long-distance service developed into a competitive market, as did wireless service. But local telephone service remained a regulated monopoly. The 1996 Telecom Act laid the groundwork for local companies to open their markets to competitors. The intent of the act was to offer customers the benefits associated with competition: innovation, cost-based prices, increased customer choices, and efficient production. But, particularly in rural areas, competition for basic local phone service still faces a significant obstacle: a technology designed for a single provider.

Traditionally, the market for local phone service has been viewed as a natural monopoly because of the way the telephone network is built. A physical connection must exist between the phone company's computer, or switch, and every customer's home or business. This physical connection, often referred to as "the last mile," is owned by the telephone company. In a truly competitive market a new entrant would need to place a duplicate physical connection from a separate switch to every customer's premise. Clearly, a single provider is more desirable in terms of the most efficient use of resources.

In rural areas, this obstacle is even greater because the cost of providing this last mile depends on the distance between the customer and the switch—the further the distance, the higher the cost. But on a per-customer basis, if a portion of this last mile is shared among several customers the cost is lower. In many rural areas, customers are located far from the switch, are small in number, and are widely dispersed (which prohibits sharing). So not only would a duplicate network be inefficient, it would generally be cost-prohibitive due to the physical distribution of customers.

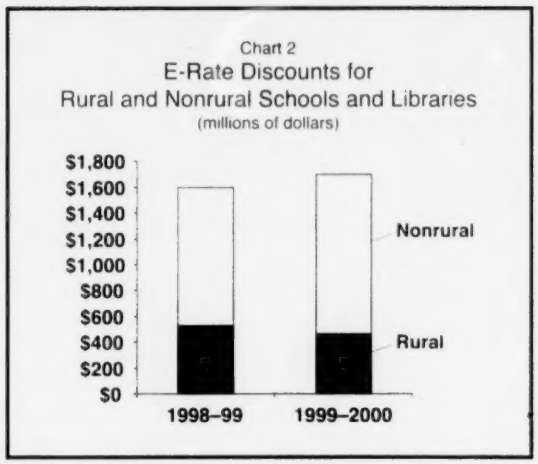
The 1996 Telecom Act established a framework for two types of competition to circumvent this problem of the last mile. The first approach allows a competitor to lease a portion of the existing network (such as the last mile) from the incumbent telephone company. The competitor then offers its own services to customers using that leased portion of the network. The second approach allows a competitor to re-sell the existing telephone company's service. In general, leasing offers more advantages to the customer—leasing allows a competitor to offer the customer different services, while re-selling merely provides a customer with a new point of contact. But in rural areas, both leasing and re-selling face serious hurdles—leasing may be financially infeasible due to a complex system of cross-subsidies among telecom services, and re-selling may be unprofitable because there are few potential customers.

Future articles in the *Main Street Economist* and elsewhere will explore this competition issue in rural America. We will examine whether these two approaches to competition for basic phone service have overcome this technological barrier of the last mile, and whether rural and urban residents have the same competitive choices.

Government support for healthcare and education

Two of the most important issues regarding quality-of-life in rural America are access to healthcare and access to education. Historically, rural regions have lagged behind urban areas in standards of service and access to new developments in both areas. Telecom advances promise to help close this gap and mitigate the negative effects of remoteness, distance, and shifting demographics. In education, *distance learning* can offer resources and opportunities that were unavailable in rural areas only a

few years ago. In healthcare, advances in *telemedicine* include long-distance video-conferencing with specialists, rapid transmission of images or data, and increased access to patient information or medical education materials on the Internet.



In passing the 1996 Telecom Act, Congress laid the foundation to provide financial assistance to healthcare providers and to schools and libraries in rural America. The first mechanism for accomplishing this was the *E-rate*, which provided funds for schools and libraries in the form of discounts on various telecom services, including Internet access, internal connections (LANs/WANs[4]), and high-speed connections. In many cases these discounts offered relief of up to 90 percent of the purchase price. Although the E-rate is not limited to rural schools, the FCC specifically targeted schools in rural, high-cost areas to receive the highest discounts. The other mechanism was a system of discounts to rural healthcare providers to ensure that prices paid for advanced services were the same as those paid by healthcare providers in urban and suburban areas. These healthcare discounts are available to local health departments or agencies, as well as caregiving institutions, and may be applied to almost all telecom services.

Since the act's passage, millions of dollars have been distributed through both mechanisms. The first distribution of E-rate discounts accounted for more than $1.6 billion, with rural schools and libraries receiving 33 percent of the funds, or $526 million (Chart 2). The second distribution provided $1.7 billion, with rural areas receiving 28 percent or $468 million. The support for rural healthcare providers is much smaller in scope, offering just over $2 million to over 300 rural healthcare providers in 1999.

In coming months, the Center for the Study of Rural America will take an in-depth look at exactly where these funds are going, which rural communities have benefited from this support, and which have not. We will examine whether the communities with the greatest need and the most to gain from these programs are taking full advantage of the discounts.

Wireless technology

Recent regulatory developments have placed the wireless industry in a unique position to serve rural America. In 1999, Kansas was the first state to grant a wireless provider, Sprint PCS, classification as an *ETC* (eligible telecommunications carrier). ETC status allows the wireless provider (subject to certain conditions) to receive dollars from a statewide fund to offset the cost of serving high-cost rural areas. This fund is known as the universal service fund. ETC status also makes the provider eligible for support from the federal universal service high-cost fund. Regulators have not yet determined if a wireless service must replace the wireline service in order to receive funding, or whether both types of provider could receive dollars for serving the same high-cost rural areas.

In either case, the potential now exists for public funds to assist in the deployment of rural wireless service. This adds a new layer of complexity to the outlook for competition in rural areas, and could also affect the availability of advanced services. Over the course of the next year, the Center for the Study of Rural America will track these regulatory developments and assess their impact on wireless technologies as a viable alternative for rural residents.

Conclusion

There is no doubt that advances in telecommunications and data technology have revolutionized the way the world does business. But will the benefits will flow equally to everyone? For the people of Main Street, economic sustainability and future development will depend on whether the telecom revolution creates a digital divide or a digital bridge between rural and nonrural America.

[1] Broadband is defined by the FCC as the capability of supporting speeds at least 200 kilobits/second in both directions.

[2] As for microwave, the technology (known as MMDS or LMDS) involves transforming what was originally a one-way wireless video transmission service into a two-way data service. This conversion is currently underway in many areas, and LMDS or MMDS licenses have been granted throughout much of the country. However, it is likely that providers will initially focus on urban areas with high concentrations of customers. The acronym MMDS stands for Multichannel / Multipoint Distribution System. The acronym LMDS stands for Local Multipoint Distribution Service.

[3] Computer Economics, Inc., Carlsbad CA

[4] Local Area Networks or Wide Area Networks

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